

# ACTIVITY 7 GRADES 7-12

## Objectives

- Students will apply the scientific method.
- Students will perform an experiment on various plant and beetle associations.
- Students will determine surface area (and biomass) differences and analyze data.
- Students will help determine how safe exotic *Galerucella* beetles are as a biocontrol.

## Time Suggestion

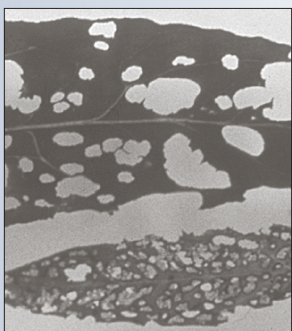
Two-three class periods.

## Wisconsin Model Environmental Education and Science Standards

### Environmental Education:

A.8.2, A.8.4, A.8.5, B.8.8.

**Science:** C.8.2, C.8.5, C.8.6, F.8.8, C.12.3, F.12.8.



Typical *Galerucella* feeding damage.

## BEETLE SMORGASBOARD\*

### DESCRIPTION

Students compare feeding behavior of *Galerucella* biocontrol beetles on a variety of plants, including house plants, farm crops, landscape plants, forest plants, wetland plants, or related species.

### PROBLEM

Do exotic *Galerucella* beetles feed on any plants other than purple loosestrife?

### MATERIALS

- ☐ Copies of student handouts. "Experimental Procedures" (page 23) and "Lab Report" (pages 24-25).
- ☐ 1 per student, 1 mm-square graph paper for lab data.
- ☐ Per team, 1 stereoscope, 4-10-power magnification or magnifying lenses.
- ☐ Analytical balance (optional, for activity extension).
- ☐ 1 per team, 15-cm diameter petri dish with cover and appropriately sized filter paper.
- ☐ 1 roll write-on cellophane tape and pencil.
- ☐ 15-cm ruler.
- ☐ Scissors.
- ☐ 5 per team, *Galerucella* beetles, stored in vial until used.
- ☐ Aspirator for moving or catching beetles.
- ☐ 1 per team, purple loosestrife leaf.
- ☐ 3 per team, similarly sized leaves of different plant species.
- ☐ 1 per team, 250-mL beaker with 200 mL water (distilled, if possible) at room temperature.
- ☐ Sink for additional water and disposal of used water.

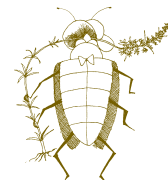
### PREPARATION:

- Call the Wisconsin Purple Loosestrife Biocontrol Program at (608) 266-2554 to obtain *Galerucella* biocontrol beetles, or field collect them late in spring or mid-summer. Divide beetles into groups of 5 for each student team.



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## ACTIVITY 7 BEETLE SMORGASBOARD (CONTINUED)

Teacher and/or students bring in 6-8 leaves from various known species of plants, including purple loosestrife, within several days of the activity. Store in refrigerated, sealed plastic bags.

Students categorize each species of leaf: houseplant, farm crop, landscape/forest/wetland plant, and identify if the species is related to purple loosestrife or not.

### PROCEDURES

1. Have students follow directions on “Experimental Procedures” handout.
2. Discuss these questions related to experimental conclusions with the class:
  - ✦ During the procedures, why were you asked to clean and wipe the scissors between cuttings of each plant species?
  - ✦ Why did we cut each leaf into equal sized pieces?
  - ✦ List the plant species used by beetles for feeding.
  - ✦ What conclusions can you draw from your observations?

### BACKGROUND INFORMATION

Testing potential biocontrol organisms is crucial for their safe and effective use. Students can do real, original research in this activity by using untested plant species. Testing with the pest plant and alternatives is called choice testing. A test with just an alternative plant is called starvation testing. Which type do you think is best? Are both tests needed? Why/why not?

### STUDENT ASSESSMENT

Use the following factors when assessing student performance:

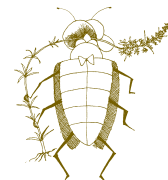
- ✦ Close adherence to the experimental design and clear notes related to observations.
- ✦ Development and explanation of conclusions that are supported by the observations.
- ✦ Accurate and careful treatment of plant species in order to preserve experimental accuracy.

### EXTENSIONS

Before the students are allowed to place their plant cuttings in the petri dish, have the students measure the mass of the leaf pieces using the balance. They will then have to calculate the changes in biomass following the 24-hour feeding period by measuring the mass of the remaining leaf pieces. Be sure to set up control leaf pieces in a petri dish to which no beetles are added. Compare weight loss (if any) in controls to weight loss of leaves kept with beetles. Why might you want to subtract control weight loss from any weight loss observed with beetles before making conclusions about beetle feeding?

Before collecting plant leaves, contact the Wisconsin Purple Loosestrife Biocontrol Program at (608) 266-2554 for a list of plant species that have already undergone this type of experiment. Try to test one or more plant species that have never been tested before so students can do original research! After the experiment, report your results to the Biocontrol program by sending a list of species tested and a copy of the lab report for any species (other than loosestrife) fed upon by the beetles to [brock.woods@wisconsin.gov](mailto:brock.woods@wisconsin.gov)!

\* This activity was developed with the help of the Lake Holcombe High School Plant Science/Horticulture Teacher's *Galerucella californiensis* Lab and Experimental Activity 1 – Biological Control.



## ACTIVITY 7 STUDENT HANDOUT

### Experimental Procedures

#### DAY 1

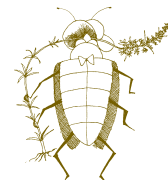
1. Get supplies from teacher.
2. Obtain one purple loosestrife leaf and one leaf of similar size from each of three different species of leaves.
3. Divide circular filter paper into quarters by drawing a pencil line through the center of the paper and another line perpendicular to the first line. Number each quarter by writing the number nearest the arc of each quarter.
4. Soak filter paper with distilled water and allow excess water to drip off. Place in petri dish.
5. Cut each leaf into 2-cm by 2-cm square pieces. Be sure to dip, rinse, and rub off scissors blades between the cutting of each new leaf species. **NOTE:** Do not contaminate the cuttings. Be sure to dump out beaker and refresh with new water between cutting each plant species. **DO NOT MIX UP YOUR PIECES!** Place each plant species into its own pile.
6. Place each leaf piece into a different quarter of the filter paper and record its location number on your data sheet.
7. Obtain 5 *Galerucella* beetles from teacher and place them in the center of the moistened filter paper and **IMMEDIATELY** cover. (Beetles can fly – **DO NOT** allow escapes). Be sure to record the time of release.
8. Tape cover on opposite sides of the petri dish so cover is held on firmly.
9. Print your group name on tape near outer edge of petri dish cover.
10. Document observations on data sheet.
11. Use stereoscopes or magnifying lens to observe the following: (a.) beetle movements, (b.) use of appendages, and (c.) actual feeding activities.
12. Near the end of the period of Day 1, place the petri dish in a safe, well-lit area.

#### DAY 2

1. After the 24-hour observation period, place the leaf pieces on the 1 mm graph paper.
2. Trace the remaining leaf shapes and number them with their corresponding filter paper numbers found in their quarters.
3. Determine (estimate) the number of square millimeters of leaf missing. Remember you began with a piece that measured 2 cm on each side.
4. Figure the percent of leaf consumed by the beetles during the 24 hours of exposure to the leaves.

$$\frac{\text{Number of Square Centimeters Consumed}}{\text{Number of Total Square Centimeters before Feeding}} \times 100 = \text{Percent Consumed}$$

5. Return all beetles to the teacher.
6. Clean up the laboratory space and equipment.



## ACTIVITY 7 STUDENT HANDOUT

### Lab Report (page 1 of 2)

#### Group Members:

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

#### Identifying Your Test Subjects:

Fill in the following chart. Write the common and scientific name for each of the four leaves your group is using. One of them must be Purple Loosestrife (*Lythrum salicaria*).

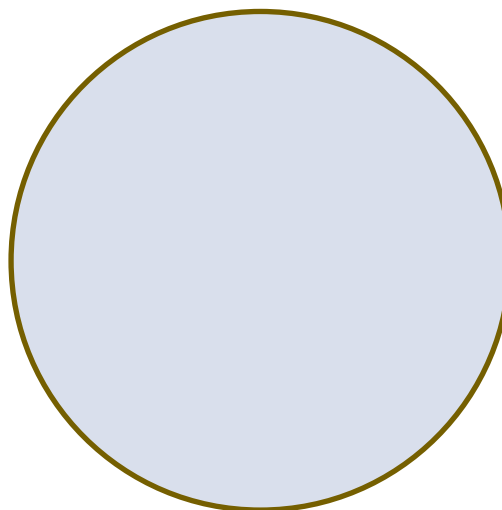
Plant Category	Plant Type	Quarter Number	Common Name	Scientific Name	Habitat
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

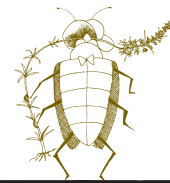
**Plant Categories:** Houseplant, Farm Crop, Forest Plant, Landscape Plant, and Wetland Plant.

**Plant Types:** N = Native, E = Exotic.

#### DAY 1 – Experimental Set Up

Show the placement of the leaf pieces in the circle to the right and how you marked your filter paper in the petri dish:





## ACTIVITY 7 STUDENT HANDOUT

### Lab Report (page 2 of 2)

#### Observations:

Note location (on plant) of each *Galerucella* sp. beetle, and if feeding has taken place:

1 minute after placing the beetles:

5 minutes after placing the beetles:

10 minutes after placing the beetles:

15 minutes after placing the beetles:

30 minutes after placing the beetles:

Conclusion (Based on the observations your group made during the lab.)

Hand in your Lab Report and place your petri dish in a well lit, safe, and quiet location.

#### DAY 2 – 24-Hour Observation Follow-up

1. Attach your leaf tracings on the graph paper and your calculations of percent consumed for each leaf in your experiment.
2. Write a conclusion statement which links your Day 1 Observations to the Day 2 Observations and Calculations.